Figure 1
General Packet Processing Examples
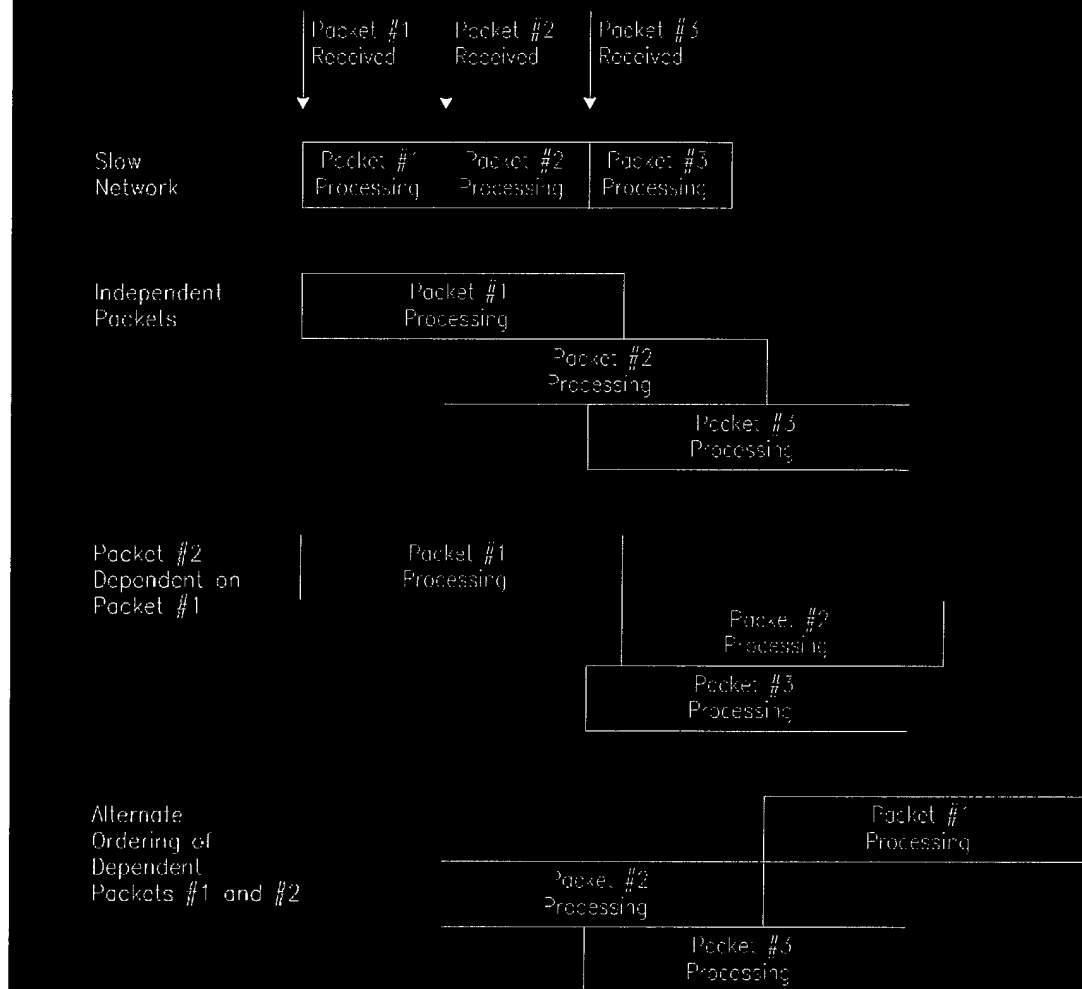
Packet #1 Received | Packet #2 Received | Packet #3 Received

Slow Network — Packet #1 Processing | Packet #2 Processing | Packet #3 Processing

Independent Packets — Packet #1 Processing / Packet #2 Processing / Packet #3 Processing

Packet #2 Dependent on Packet #1 — Packet #1 Processing / Packet #2 Processing / Packet #3 Processing

Alternate Ordering of Dependent Packets #1 and #2 — Packet #1 Processing / Packet #2 Processing / Packet #3 Processing

Figure 2
Optimal Overlap of Dependent Packets
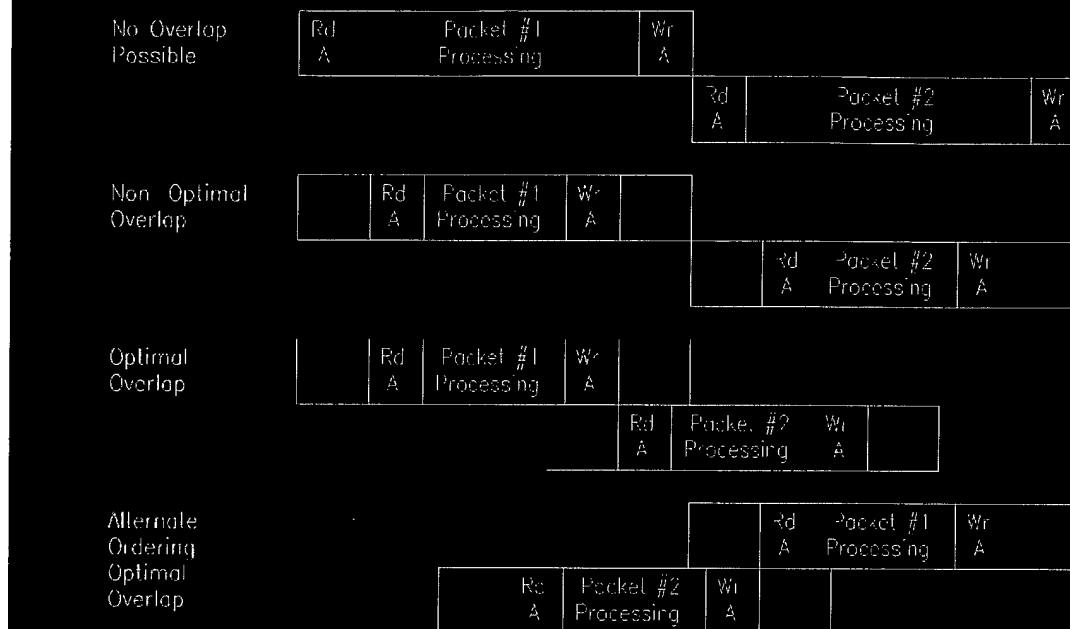
Figure 3
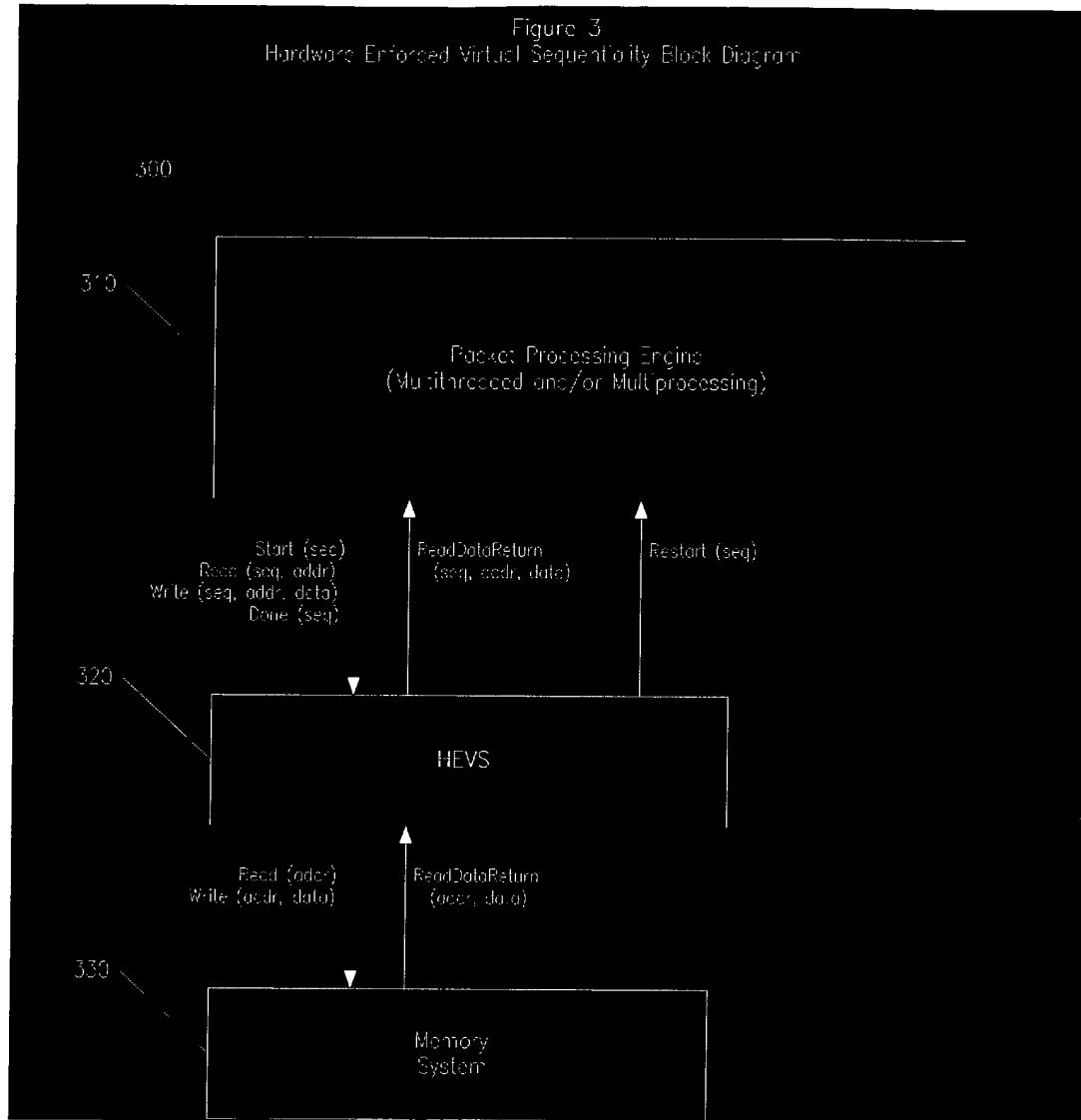### Hardware Enforced Virtual Sequentiality Block Diagram

300

310

Packet Processing Engine
(Multithreaded and/or Multiprocessing)

Start (seq)
Read (seq, addr)
Write (seq, addr, data)
Done (seq)

ReadDataReturn
(seq, addr, data)

Restart (seq)

320

HEVS

Read (addr)
Write (addr, data)

ReadDataReturn
(addr, data)

330

Memory System

Figure 4
Hardware Enforced Virtual Sequentiality Mechanism
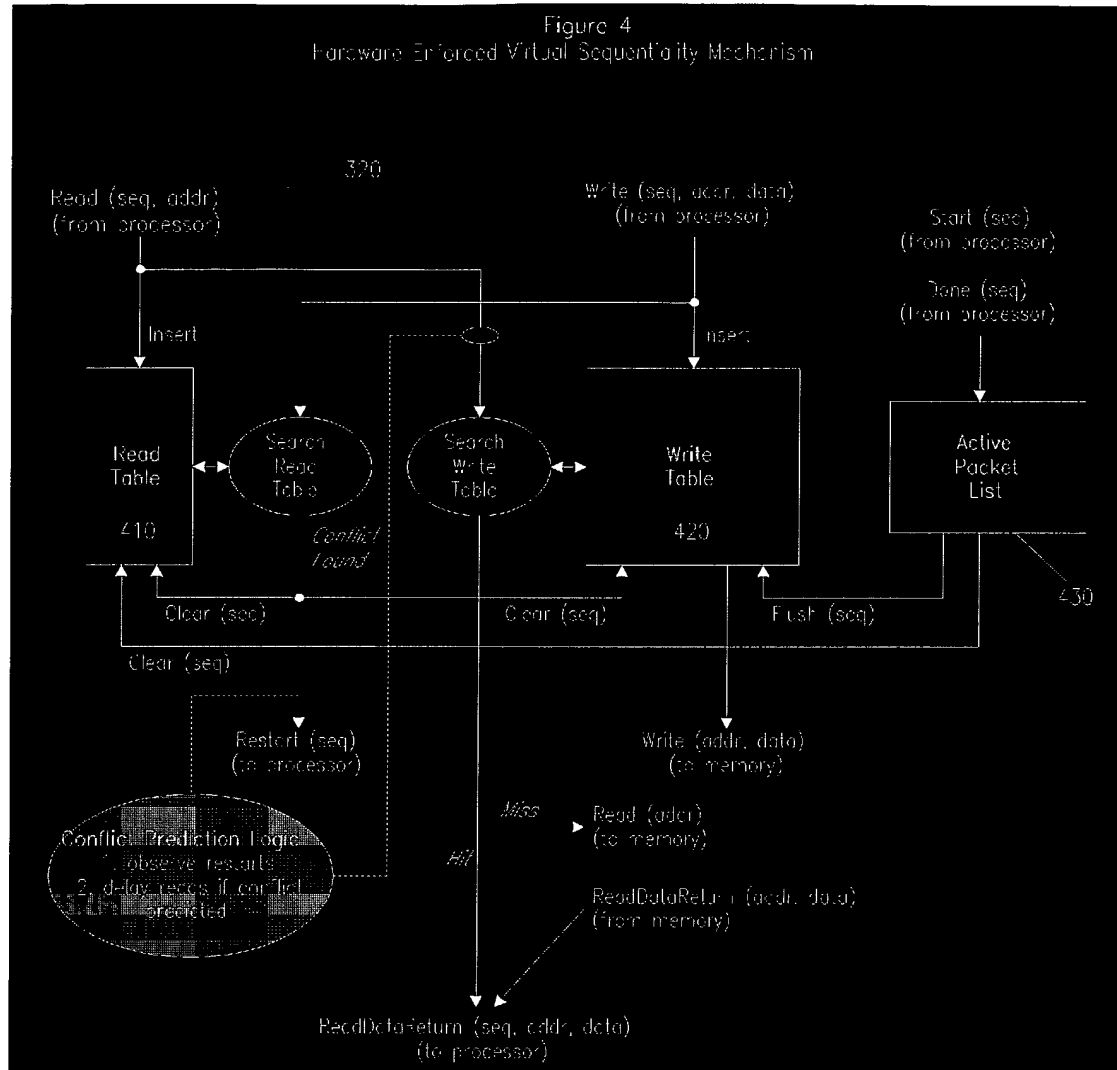
Figure 5
Read Table and Write Table Detail

Read Table 410 | Write Table 420

	Seq.	Addr.
p:	1	A
q:	2	B
s:	3	B
t:	2	A

	Seq	Addr	Data	Depend
r:	2	B	X	3
u:	1	A	X	(null)

Time Sequence:

1. Packet #1 reads location A
   Entry p: created in Read Table
   Write Table is searched, no matches found so memory read is performed

2. Packet #2 reads location B
   Entry q: created in Read Table
   Write Table is searched, no matches found so memory read is performed

3. Packet #2 writes location B
   Entry r: created in Write Table
   Read Table is searched, no conflicts found

4. Packet #3 reads location B
   Entry s: created in Read Table
   Write Table is searched, entry r: found, data X forwarded and dependency list updated

5. Packet #2 reads location A
   Entry t: created in Read Table
   Write Table is searched, no matches found so memory read is performed

6. Packet #1 writes location A
   Entry u: created in Write Table
   Read Table is searched for newer sequence read, entry t: is found
       Conflict is signaled to processor, Packet #2 is restarted
       Entry q: and all other sequence 2 entries are deleted
       Deletion of entry r: triggers Packet #3 restart signaled

Figure 6
Conflict Detection Processing Examples